

A national user facility serving the scientific community with high-performance computing and data analysis







Oak Ridge Leadership Computing Facility

The Oak Ridge Leadership Computing Facility (OLCF) was established at Oak Ridge National Laboratory in 2004 with the mission of accelerating scientific discovery and engineering progress. The OLCF achieves this mission by providing world-leading computational performance and advanced data infrastructure. A dedicated team of computational scientists enables broad use and applicability of high-performance computing technologies coupled with data analytics, visualization, storage, and networks at the highest level of capability.



Leadership Computing Solves Big Problems

DOE leadership computing facilities allocate supercomputing resources that substantially exceed those commonly available for research. By enabling the simulation of problems that are larger and/or more detailed in the shortest amount of time, the OLCF's Titan gives researchers the capabilities to answer fundamental questions and to advance the knowledge and application of a variety of sciences. From enabling the highest-fidelity climate models to facilitating new discoveries in materials to paving the way for next-generation nuclear reactors, OLCF provides tools that advance the world's understanding of many complex energy phenomena.





Titan—Accelerated Answers, Greater Realism

A Cray XK7 high-performance computing system, Titan achieves 10 times the speed with the same energy efficiency of its predecessor, the Jaguar supercomputer, in the same footprint. It is a hybrid of advanced central processing units and energy-efficient, high-performance graphics processing units (GPUs). Benefits are decreased time to solution, increased complexity of models, and greater realism in simulations.

Occupying more than 5,000 square feet, Titan comprises 200 cabinets that house 18,688 NVIDIA Tesla K20X GPU accelerators and 18,688 16-core AMD Opterons (299,008 cores total), with 710 terabytes of memory.



Unmatched Expertise

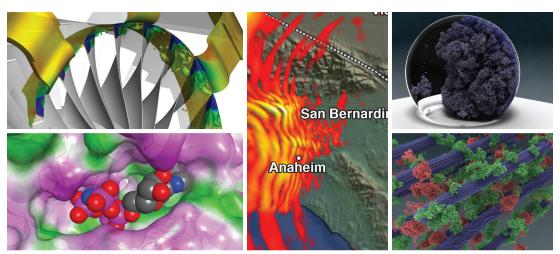
Approximately 1,000 researchers per year from industry, academia, and government use the OLCF to push the frontiers of their research. To help users make the most of premier supercomputers and data storage, analysis, and visualization facilities, the OLCF offers a team of experts.

Account specialists grant access to the various OLCF resources. User support specialists provide training documentation and problem resolution services. OLCF scientists and technologists work with users to maximize their research output through application development and scientific collaboration. Analysis and visualization specialists help turn data into insight. When OLCF systems enable users to publish a finding or improve a product, an outreach team helps share the good news.

Behind the scenes, OLCF experts administer and configure systems and ensure cybersecurity. During hardware installations and upgrades, staff members rigorously test and continually monitor systems. They ensure that new systems meet the appropriate hardware and software requirements that are important to the scientific community. Specialists update and integrate the networks, file systems, and archival storage infrastructure into OLCF ecosystems. Experts continually work on programming tools, such as compilers, debuggers and performance analyzers, that will allow scientific and engineering applications to harness the ever-increasing power of next-generation computers.

Experienced at deploying world-class systems to meet the needs of researchers, the OLCF leadership team guides the overall vision of the center and manages its day-to-day operations by supervising system installations and upgrades, overseeing research on the supercomputers, planning and designing future systems, and telling the world about all the extraordinary high impact achievements at the OLCF.





Game-Changing Research Results

The OLCF's sponsor is the DOE Office of Science, which is America's single largest supporter of basic research in the physical sciences and is working to address some of the world's most pressing challenges. Instrumental in breakthroughs in biology, chemistry, seismology, engineering, energy, and other fields, OLCF simulations have improved the safety and performance of nuclear power plants, turbomachinery, and aircraft; aided understanding of climate change; accelerated development of new drugs and advanced materials; and guided design of an international fusion reactor. The simulations have explored supernovas, hurricanes, biofuels, neurodegenerative diseases, and clean combustion for power and propulsion. Research challenges remain, and Titan can help.

Titan brings a new era for science and engineering as computing approaches exascale—1,000 times faster than petascale.

Three Paths to Titan

Because the OLCF is a DOE Office of Science User Facility, researchers from around the globe with a question that requires large-scale computing systems can submit a proposal for time on OLCF computing resources. Researchers gain access to the OLCF, typically with awards of millions of core-hours, through one of the following three competitive, peer-reviewed allocation programs.

Innovative and Novel Computational Impact on Theory and Experiment Program (INCITE)

The INCITE program, which allocates up to 60% of the OLCF resources, provides allocations to computationally intensive, large-scale research projects that aim to address grand challenges in science and engineering.

ASCR Leadership Computing Challenge (ALCC)

The ALCC program, which allocates up to 30% of the OLCF resources, allocates time to projects with an emphasis on high-risk, high-payoff simulations in areas directly related to the DOE mission and for broadening the community of researchers and industry representatives capable of using leadership computing resources.

Directory's Discretionary (DD)

The DD program, which allocates up to 10% of the OLCF resources, has three primary goals which include preparing for a leadership computing competition, broadening the community of researchers capable of leadership computing, and developing R&D industrial partnerships, both internal and external to ORNL, to advance DOE and ORNL strategic agendas.



